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Evaluating megaprojects: from the “iron triangle” to network mapping

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Abstract

Evaluation literature has paid relatively little attention to the specific needs of evaluating large, complex industrial and infrastructure projects, often called 'megaprojects'. The abundant megaproject governance literature, in turn, has largely focused on the so-called "megaproject pathologies", i.e. the chronic budget overruns, and failure of such projects to keep to timetables and deliver the expected social and economic benefits. This article draws on these two strands of literature, identifies shortcomings, and suggests potential pathways towards an improved evaluation of megaprojects. To counterbalance the current overemphasis on relatively narrowly defined accountability as the main function of megaproject evaluation, and the narrow definition of project success in megaproject evaluation, the article argues that conceptualising megaprojects as dynamic and evolving networks would provide a useful basis for the design evaluation approach better able to promote learning and to address the socio-economic aspects of megaprojects. A modified version of "network mapping" is suggested as a possible framework for megaproject evaluation, with the exploration of the multiple accountability relationships as a central evaluation task, designed to reconcile learning and accountability as the central evaluation functions. The article highlights the role of evaluation as an 'emergent' property of spontaneous megaproject 'governing', and explores the challenges that this poses to the role of the evaluator in governance.

Keywords: *megaprojects, network governance, learning, accountability, socio-economic impacts*

Résumé

La littérature en évaluation a payée relativement peu d'attention aux défis spécifiques que pose l'évaluation des grands, complexes projets d'infrastructure, souvent appelés « mégaprojets ». L'ample littérature concernant la gouvernance des mégaprojets, pour sa part, s'est concentré principalement sur les « pathologies » des mégaprojets, à savoir la tendance chronique de ces projets de dépasser leurs budgets et les échéances de réalisation, ainsi que de générer les bénéfices socioéconomiques escomptés. Cet article s'appuiera sur ces deux littératures, y identifie des faiblesses, et suggère des pistes vers une évaluation améliorée des mégaprojets. Afin de redresser le présent déséquilibre en faveur de la reddition des comptes – définie d'une manière relativement étroite – comme la principale fonction de l'évaluation des mégaprojets, et en vue d'élargir les critères de succès dans l'évaluation des mégaprojets, cet article suggère qu'une conceptualisation des mégaprojets comme des réseaux dynamiques et évolutifs fournit une base fructueuse pour la conception d'une approche d'évaluation mieux à même de promouvoir l'apprentissage et d'adresser les aspects socioéconomiques des mégaprojets. Une version adaptée de la « cartographie de réseaux » est proposée comme un possible cadre pour l'évaluation des mégaprojets, avec l'exploration des multiples rapports de responsabilité comme une tâche d'évaluation centrale, conçue pour réconcilier l'apprentissage et la reddition des comptes comme les fonctions d'évaluation centrales. L'article souligne le rôle de l'évaluation comme une propriété « émergente » de processus spontanés de gouvernement des projets, et explore les défis liés au rôle de l'évaluateur dans la gouvernance des mégaprojets.

Megaproject pathologies and “the socio-economic”

Increasing attention has recently been paid to what have become called “megaprojects” (e.g. Flyvbjerg et al., 2003; Flyvbjerg, 2007; 2011), i.e. “large-scale, complex infrastructure projects usually commissioned by governments and delivered through partnerships between public and private organisations, with multiple partners, high uncertainties, and considerable political stakes (van Marrewijk et al., 2008: 591). These typically include infrastructure construction projects, such as motorways, tunnels, bridges, railways or ports, which frequently “respond to global competition among cities for investments, knowledge workers, tourists and prestige” (Bornstein, 2007), and are expected to deliver multiple benefits to the society. What make megaprojects distinct are their exceptionally large budgets, and hence considerable economic and political interests involved; considerable temporal and spatial scales; continuous evolution and dynamism, including project governance and the institutional framework; and strong normative disagreements among parties involved, at different levels of governance. Furthermore, their one-of-a-kind nature (lack of precedents), as well as the complex causal relationships and high degree of scientific, political and institutional uncertainties render megaprojects particularly challenging objects of evaluation (e.g. Altshuler and Luberoff, 2003; Flyvbjerg, 2007; 2011; Flyvbjerg et al., 2003; Flyvbjerg and Priemus, 2007; OMEGA 2012).

Evaluation literature has thus far paid surprisingly little attention to the evaluation of such large infrastructure projects (cf. Verweij and Gerrits, 2013), whereas the literature on the governance and evaluation of megaprojects has concentrated mainly on so-called megaproject “pathologies”, notably cost overruns, time delays, public resistance, and failure to deliver the promised benefits (Priemus, 2010). From the perspective of this “iron triangle” of megaproject performance criteria (OMEGA, 2012: 2), uncertainties appear as exclusively problematic, insofar as they accentuate the risk of chronic overestimation of the benefits and underestimation of the costs and construction time of the project (e.g. Flyvbjerg, 2007: 12-13). This paper argues that such an emphasis on megaproject “pathologies” is based on an insufficient and one-sided conceptualisation of megaprojects, and has contributed to an excessive focus of accountability as the sole objective of evaluation of such projects, while overlooking in particular the potential benefits of uncertainty as a source of learning, reflexivity and adaptive governance. With few exceptions (e.g. OMEGA, 2012), literature on megaproject governance and appraisal has failed to take on board many of the lessons from policy and programme evaluation and network governance, or integrate the broader objectives of sustainable development into its evaluation arsenal.

The article argues that a central challenge of megaproject evaluation is to foster the adoption of more reflexive and learning-oriented evaluation approaches, while fully taking into account especially the socio-economic impacts of such large-scale projects. Greater attention to learning and improvement should not mean abandoning accountability as a major objective of evaluation – rather, this article calls for a better balance between the accountability and learning objectives, and for a redefinition of accountability so as to better accommodate the two evaluation functions. The article starts from the observation that despite their numerous common characteristics, megaprojects represent a partly heterogeneous group of entities that can usually better be described as networks or programmes of projects (OMEGA, 2012) than as discrete projects with clearly circumscribed boundaries.

The article is based on a survey of literature conducted as part of a project exploring the prospects of the evaluation of socio-economic aspects of geological disposal of high-level radioactive waste in a deep underground repository.¹ Such projects illustrate the diversity of megaproject in that they exhibit many features typical of megaprojects – even pushing these to an extreme – while in some ways departing from “conventional” megaprojects. Starting from a broad definition of evaluation, covering *ex ante* assessment as well as the various types of monitoring and *ex post* evaluation,² the article emphasises the emergent nature of evaluations and their consequences in a context involving multiple actors in the day-to-day governing of megaprojects. A starting assumption underpinning this article is that no single evaluation framework can satisfy the multiple needs of megaproject evaluation. Hence, the applicability of the suggestions towards ‘improved’ megaproject evaluation presented in this article need to be judged case by case, in the light of the largely uncontrollable context of a broader ‘ecosystem’ of evaluations likely to emerge as a product of spontaneous project ‘governing’ (Sanderson, 2012).

The paper is structured as follows. Section two introduces the dominant literature on megaprojects and summarises the key argument concerning megaproject “pathologies”. Section three traces the roots of the current overemphasis on accountability by identifying shortcomings in the way megaproject governance is conceptualised in the literature. Section four outlines key elements of an alternative approach to megaproject evaluation, drawing in particular on the “network mapping” of Benjamin and Greene (2009), and network evaluation as described by Hertting and Vedung (2012). Section five concludes.

Megaprojects and their “pathologies” – the “iron triangle”

A number of characteristics inherent to megaprojects render their *ex ante* evaluation particularly challenging. These include notably the perceived uniqueness of the designs and technologies applied, i.e. the lack of previous experience of sufficiently similar projects; the considerable temporal and spatial scales involved; the dynamism and evolution of the project scope, ambition and governance; complex, multilevel and multi-actor governance structures; high uncertainties that result notably from the long time-scales, the strong potential of irreversible impacts, and the evolving nature of the projects; and the tendency of the project benefits to accrue at the national level, while most of the negative impacts are felt locally (Flyvbjerg et al. 2003; Gagnon, 2003: 86-87; Flyvbjerg, 2007; 2011; Priemus, 2010).³

Empirical experience from across the world demonstrates that such projects frequently suffer from “pathologies” (Primus, 2010), i.e. they fail in the light of the “iron triangle” criteria of project management (OMEGA, 2012) of delivering projects “on time, on budget and to prescribed specifications” (Flyvbjerg et al., 2003). From this perspective, the dynamics of project selection would lead to the “survival of the unfittest”, i.e. the selection and financing of the least viable among the projects (Flyvbjerg, 2009; 2011). Flyvbjerg et al. (2003; see also Flyvbjerg, 2009) evoke two key reasons for such a failure in project selection: first, “optimism bias”, or “planning fallacy”, i.e. the natural inclination of people to estimate things more positively than one could objectively derive from practice, and second, “strategic misrepresentation”, or “malevolent design” (van Marrewijk et al., 2008: 599), whereby project approval decisions would be mainly determined by strategic behaviour by planners and project advocates who would have an interest to lie and represent costs and benefits in a manner that would maximise the chances of the project winning public funding (Wachs, 1989; Bruzelius et al., 2002: 145; Flyvbjerg, 2009; 2011: 329; Flyvbjerg et al., 2002; 2009; Cantarelli et al., 2010). When strong political pressure is absent, the optimism bias would prevail, whereas “strategic misrepresentation” would explain the failure in politically charged situations – arguably the case in most megaprojects. Short political mandates further encourage misrepresentation, as does the fact that the costs of overruns and failed benefits would fall upon taxpayers and society at large rather than on the private sector project developers.

Bruzelius et al. (2002) and Priemus (2010: 1025) further argue that the root cause for incentive structures that encourage lying and opportunism lies in the ***conventional approach to megaproject planning***, whereby

- the lack of feasibility studies and an excessively technical approach to planning and management lead to premature commitment to the project and a specific

- technical solution;
- the analysis of external effects and inclusion of affected groups occur too late in the process;
- no risk analysis is conducted; and
- the various institutional, organisational, regulatory and accountability issues are overlooked.

To treat the pathologies, Flyvbjerg et al. (2003; see also Flyvbjerg, 2011) suggest minimising opportunism through explicit articulation of performance specifications, explicit formulation of the regulatory regime, and involvement of commercial risk capital. For evaluation, the fourth remedy is the most relevant: designing comprehensive *ex ante* governance arrangements – institutional and legal mechanisms designed to enhance transparency as well as public and private sector accountability through external scrutiny (e.g. benchmarking, peer review, media exposure, financial rewards, and sanctions). In essence, the call is for greater accountability as the main purpose and function of evaluation, as for instance deliberative approaches would be ineffective in the context of exceptionally high economic and political stakes (Flyvbjerg et al., 2003: 7).

Shortcomings in the conceptualisation and evaluation of megaprojects

The “iron triangle” approach to megaproject management has its critics in megaproject literature (e.g. van Marrewijk et al., 2008; Osland and Strand, 2010; Giezen, 2012; Sanderson, 2013; OMEGA, 2012), yet the impact of such alternative approaches in wider debate and governance of megaprojects has remained limited. The following section summarises the criticisms most relevant for the evaluation of megaprojects.

Diversity of megaprojects, constantly evolving project goals

Despite their several common characteristics, megaprojects do not represent a homogeneous group of entities, and, consequently, “not all mega projects are planning disasters” (Giezen, 2012: 781), not even in the light of the “iron triangle” criteria.⁴ As a project evolves, the redefinition of its objectives may fundamentally modify the nature, scope, and rationale of the project, and a ‘failed’ project may hence be reclassified as a success (OMEGA, 2012). Rather than a drop in an ocean of failures, these projects provide a basis for more in-depth analysis of the conditions under which an individual megaproject can indeed succeed (e.g. Giezen 2012) – an approach largely neglected in the current megaproject research, which has been dominated by large-N statistical analysis unable to account for the

influence of local conditions on project performance (Verweij and Gerrits, 2013: 42). Furthermore, Osland and Strand (2010: 80) argue that the hypothesis that the “unfittest” projects would be selected has not been adequately tested, since no comparison has been conducted between the approved and rejected projects.

The diversity of megaprojects means that the relevance of the iron triangle criteria varies across cases. For example, large mega-events such as Olympic Games must deliver the final ‘product’ on time, and preferably within budget and according to specifications, if they want to avoid harsh public and media criticism. For most megaprojects, budget and delivery time are only a part of a broader range of relevant considerations. For instance, unlike most megaprojects, geological disposal of radioactive waste derives its *raison d’être* from the imperative to solve “the waste problem”, with safety as the overriding concern and performance criterion. Delivering on time and within budget is important, but secondary to the overriding safety criterion. Any economic analysis of the project would be conducted in the perspective of intergenerational cost-effectiveness, rather than in terms of cost-benefit ratio. Furthermore, the long history of exceptionally deep-seated normative conflicts between the defenders and opponents of deep geological disposal sets these megaprojects apart from many others.⁵ Finally, in particular because of the prevalence of the safety criterion, the role of the state as regulator is probably even more central in radioactive waste management than in other megaprojects.

Neglect of the context and the multiplicity of rationalities

Most of the analysis of the megaproject “pathologies” has tended to adopt an external, large-N approach, by definition unable to account for the crucial role of case-specific political, environmental, socioeconomic and cultural context for the governance and success of megaprojects (OMEGA, 2012: 24-25; Verweij and Gerrits, 2013). The “iron triangle” approach fails to account for variation in rationalities and institutional structures, while building on the implicit or explicit assumption of individuals as mischievous, ruthless, opportunistic and rational maximisers of their individual utility, able to accurately calculate probabilities and optimise their own position (van Marrewijk et al., 2008; Sanderson, 2012: 439). Van Marrewijk et al. (2008: 599) offer an alternative account, seeing megaproject pathologies as an outcome of clashes between different rationalities and “project cultures”. Budget overruns, inflated forecasts, and unachieved public benefits would not result from malevolent design, but from the “*normal practice of professionals operating with limited knowledge, but influenced dramatically by a range of ambiguous and uncertain external and internal forces.*” Other scholars have attributed megaproject failures to “incoherent, inappropriate or underdeveloped

governance arrangements”, which are inadequate in the face of the unavoidable risks, uncertainties and turbulence deriving from inside or outside of the organisations involved in megaproject governance (e.g. Loch et al., 2006; Sanderson, 2012).

Nature of the evaluand: a project, a programme of projects, or a network?

Taken together, the multiplicity of megaproject types, contexts and rationalities underpinning actor behaviour point to a number of salient characteristics of megaprojects, and raise the question of the extent to which megaprojects actually can be seen as projects. From an alternative perspective, megaprojects are best understood as organic open systems, co-evolving with their context – hence the evolution of their goals and objectives. Megaprojects are characterised by both substantive and institutional complexity, i.e. the subject matter (sustainable development, regional development, radioactive waste management, etc.) exhibit characteristics of “wicked problems”. As a result, traditional vertical governance structures tend to be inadequate, as coordination is necessary between actors from both public and private sector, and across policy sectors and levels (Hertting and Vedung, 2012: 30). Finally, while the rational actor model is clearly one-sided, Sanderson (2012) argues that even the alternative approaches stressing the clash of cultures (van Marrewijk et al. 2008) and inadequate governance (Loch et al., 2006) are unsatisfactory, since they falsely assume that the complexity and irreducible uncertainties inherent in megaprojects can indeed be controlled through careful *ex ante* planning of appropriate governance measures (Sanderson, 2012).⁶ Instead of strategic planning, megaproject governance should focus more on the day-to-day practice of “real-life” megaproject “governing”, the spontaneous processes of emergent work practices, “organising rather than organisation”, and project governing in “here-and-now” (Sanderson, 2012: 441).

It can be argued that megaprojects would be more usefully characterised as “programmes of projects” (OMEGA, 2012: 36) or “*networks of people and organizations that work more or less coherently and purposefully to address complex public problems*” (Benjamin and Greene, 2009: 297; see also e.g. Hertting and Vedung, 2012). As ‘open systems’, the boundaries defining these ‘projects’ are therefore vague, fluid, and subject to constant change (Benjamin and Greene 2009; OMEGA, 2012). For instance, as a technical project, radioactive waste disposal is indeed clearly circumscribed, yet its implementation places the project in complex interaction with its territorial and cultural context, with regional development programmes, etc. In such a situation, the ‘evaluand’ cannot be clearly defined, i.e. it is not “*programmatically organised or institutionally situated*” (Benjamin and Greene, 2009: 297), and novel evaluation approaches appear as necessary.

The conventional and alternative notions of megaproject governance can be illustrated through the dichotomy between what Regeer et al. (2009) have described as the 'simple' Mode-1 and the 'complex' Mode-2 governance strategies (Table 1). The terms "Mode-2 strategy" and "network governance" are here used interchangeably to denote a range of governance theories that share a number of common key characteristics.⁷ In contrast with Mode-1, focused on seeking solutions for relatively concrete problems using well-established methodologies, Mode-2 emphasises "double-loop" learning (e.g. Argyris and Schön, 1978; Reed et al., 2010), adaptation, iteration, and flexible experimentation (Regeer et al., 2009: 518). Mode-2 strategies would be better suited for solving complex, unstructured problems that require cooperation between a broad range of actors from different institutional backgrounds (Benjamin and Greene, 2009; Regeer et al. 2009: 516, 518). The governance context and accountability structures are 'heterarchical', characterised by interdependence, lateral accountability, and organisational heterogeneity, with decision-making entailing not only rational choice among a set of known options, but in particular redefinition of the range of options available (Stark, 2000; 2001). Because of constant technological change, shifting societal preferences and power relations, and volatility of the markets, no single option is self-evidently the best, since commitment to a given option means foregoing other options, whose value cannot be readily estimated. Managing irreversibilities therefore becomes a central challenge, entailing the need to constantly balance between two objectives: keeping the options open to retain the capacity of adapt to evolving situations, and maintaining sufficient control over the system through the reduction of complexity, closing down decisions, and establishing clear lines of accountability.

Mode 2 or network governance would be justified when problems exhibit both substantive and institutional complexity, when need for coordination exists, but formal restructuring would be too demanding or politically cumbersome (Hertting and Vedung, 2012: 33, 36). While no single actor alone is dominant, not all actors are equal in mode 2 governance – especially the state often has a crucial role, as a regulator, legislator, final decision-maker and supplier of financing (Kickert, 2003: 389). Network governance may emerge spontaneously as a response to the need of coordination perceived by the network members, yet an external network 'facilitator' such as the government or an intergovernmental actor is often vital as an initiator of network governance (Hertting and Vedung, 2012).

From this perspective, complexity appears not only as a problem, but above all as an opportunity and an institutional solution. The mutual interdependencies would encourage voluntary, horizontal governance and coordination (Hertting and

Vedung 2012, 31), and the uncertainties and conflicts involved in megaproject governance could enable harnessing the inevitable uncertainties to the benefit of reflexivity, adaptability and exploration of alternative pathways (e.g. Gelatt, 1989).

Radioactive waste management represents an interesting example in view of the “participatory turn” (Sundqvist and Elam, 2010), i.e. a move towards a more dialogical, participatory and at least allegedly more reflexive governance approaches that governance in this area has taken since the early 1990s. While these megaprojects therefore no longer fully correspond to the above-described “conventional approach to megaproject planning” (Bruzelius et al., 2002; Priemus, 2010: 1025), the tensions between mode 1 and mode 2 governance persist: one single generic solution – deep geological disposal – has been widely accepted by governments and key international organisations as the ‘best’ solution for the problem, whereas public opposition, potential changes in nuclear energy policies, and persisting local opposition represent ‘external risks’ that push for “opening up” of the governance situation (Stirling, 2008). Exploration of such tensions and discrepancies would constitute a central task for the evaluation of megaprojects.

[Insert table 1]

Accountability as the dominant narrative in megaproject evaluation

The narrow definition of project success in a lot of the megaproject literature has meant that the broader sustainability criteria of evaluation, especially those relating to the socioeconomic aspects, have been largely overlooked in megaproject evaluation. The neglect of the context, and the emphasis on the rational actor model have in turn contributed to an overemphasis on planned project governance (as opposed to more spontaneous project “governing”), and *ex ante* considerations (instead of on-going monitoring and in-depth *ex post* evaluation), hence downplaying the potential learning functions of evaluation. Current megaproject literature has also paid little attention to empirical analysis of the role of evaluation in megaproject governance, governing, and policymaking – including the multiple forms of exercise of power in such processes – failing notably to incorporate lessons from the existing literature on the use and influence of policy and programme evaluation. Taken together, these factors have contributed to the prevailing perception of accountability as the primary, and sometimes the only, function of megaproject evaluation.

The problem does not, however, lie exclusively in erroneous conceptualisation of megaprojects, but also in the practical conclusions and suggestions for evaluation. For instance Flyvbjerg (2011: 341) has called attention to the paradox between the

high-risk, stochastic nature of megaproject investment and delivery on one hand, and the control-oriented, deterministic approach to megaprojects among project managers and researchers on the other. His subsequent call for more accountability and control may be well-intentioned, yet in light of lessons from both the alternative readings of megaproject governance (e.g. van Marrewijk et al., 2008; Giezen, 2012) and evaluation literature (e.g. Perrin 1998; Blalock et al., 1999), such an overemphasis on accountability as a remedy against “strategic misrepresentation” could in fact prove counterproductive, by feeding, instead of curbing, dishonesty.

Certainly, megaprojects are not an exception to the extent that accountability is the dominant agenda especially in public sector evaluation in general, in line with the trends dominant in public sector governance and management over the past decades: neoliberalism, New Public Management, and evidence-based policy. However, these trends have been accentuated by a number of characteristics specific to megaprojects. Because of the exceptionally high economic stakes in question, politicians, opposition groups and the media call for strict control of the money invested, and often employ the “iron triangle” criteria to promote or criticise megaprojects (e.g. OMEGA, 2012). The considerable scale of the investments needed also means that private sector involvement is often indispensable – and with such investments come also private sector investment criteria, and criteria for judging project success. Professional cultures probably also play a role: governance and expertise in highly technical infrastructure megaprojects is dominated by engineering, accounting, and economics disciplines, which are likely to approach the problems from a technical-economic perspective.⁸ Furthermore, the perception that it is vital to reduce uncertainty and complexity to enable project success is further compounded by the high complexity of megaprojects, with greater control and accountability then appearing as ‘natural’ remedies. Finally, the internal dynamics of the academia, and the perception among key scholars in the field of media as an essential vehicle for treating megaproject pathologies have probably further contributed to the dominance of one specific interpretation of megaproject challenges.

Ways forward: towards network evaluation of megaprojects

This section draws on the lessons from the above considerations to outline tentative ideas towards evaluation that would better recognise the heterogeneous range of megaprojects; the multiple rationalities and dynamism involved in their governance; their open-system and networked character; and the broad range of project success criteria; while helping to redress the balance currently skewed in favour of accountability and to the detriment of learning. In light of the above-

described characteristics of megaprojects, and in light of broader lessons from evaluation literature, the objective of designing an overarching “megaproject evaluation model” appears as misguided. Hence, the suggestions for megaproject network evaluation outlined in the following are not meant as universally applicable recipe. Most notably, the degree to which an individual megaproject indeed corresponds to the network governance model needs to be decided case by case.

As argued above, the characteristics of megaprojects call for greater attention to learning and reflexivity as key objectives of both the governance and evaluation of megaprojects. Nevertheless, even though learning can be seen as the central purpose of an ideal-type network governance evaluation, arguably it is accountability that constitutes the Achilles’ heel of network governance evaluation (Hertting and Vedung, 2012: 37-38). In the following, the focus will therefore be on ways of redefining accountability, integrating it with learning as a key objective of network evaluation, and exploring the consequences of such redefinition for the role of evaluation and the evaluator in network governance.

Redefining accountability in network governance

Traditionally, accountability is perceived in hierarchical terms, exercised through vertical relationships between superiors and their subordinates. The question of accountability remains crucial in megaproject governance and evaluation, if for no other reason than the amount of public money involved and the extent of the potential societal impacts of such projects, but the current strong bias in favour of accountability as the priority objective, needs to be reconsidered. In its conventional meaning “[a]ccountability evaluation is a tool for superiors to check their subordinates and to hold them and the intervention responsible for their actions” (Hertting and Vedung, 2012: 38). In network governance, accountability relationships are complex, and raise questions such as: Who can be held accountable, when no single actor has full control over neither the execution, nor the outcomes of a governance intervention? How to ‘enhance accountability’, when accountability structures are unclear and evolve constantly along with the project? As a rule, the approach adopted here calls for not minimising, but ‘making the best of’ the inevitable uncertainties cause by the multiple, overlapping, horizontal accountability relationships. Accountability would build on mutual control, and thereby advance more complex types of learning.

A redefined concept of accountability would recognise two major rationales underpinning accountability as a solution to the of principal-agent problem. The rational actor model sees accountability relationships as a means for the principal

to reduce the risk that the agent operates against the interests and objectives of principal, when information asymmetries favour the agent. The second perspective emphasises the role of ethics, responsibility, and obligation, and perceives accountability as a vehicle for discussion and greater understanding between the principal and agent about the problem at hand. Hence, problems would stem not from opportunism, but from “honest incompetence, miscommunication, organisational routines” and the like (Benjamin, 2008: 326). Accountability relationships would contribute to the continuous process of clarifying and redefining the principal’s goals through practice (ibid.) Accountability structures built on the assumptions of rational actor may be counterproductive when actor relationships are characterised by ethical, and responsibility-based considerations (Benjamin, 2008).

Network mapping in megaproject evaluation: four key tasks

In practice, clarification of the multiple accountability relationships in order to foster learning could build on the idea of “network mapping” of megaprojects. Four generic and partly overlapping tasks are suggested in the following: characterising the network and defining its boundaries; defining the accountability structures; clarifying the goals and objectives of the network – to provide a referential for evaluation; and, exploring the role of evaluation and the evaluator in project governance.

Task 1: Characterising the network and defining its boundaries

The first task of network mapping follows suggestions by Benjamin and Greene (2009): characterising the network and defining its boundaries, in collaboration with network members. Key questions for such an investigation include the following: How formal is the network? Does the network have an identity? Do network partners recognise the network? Is there a formal governance structure? How are decisions made? Who/what is included in or excluded from the network? Which value assumptions underpin the decisions of inclusion/exclusion? Network characterisation would hence address issues such as distrust, power, dysfunctional cliques, and missing relevant actors (Benjamin and Greene, 2009: 307). In politically highly charged situations – typically the case in radioactive waste management – the definition of ‘insiders’ and ‘outsiders’ is far from self-evident: the ‘insiders’ may seek to avoid responsibilities for difficult decisions, whereas some actors who consider themselves as ‘outsiders’ are perceived by others as ‘insiders’ – and hence partial, especially in the eyes of the critics of the project. Furthermore, some opponents of the project may choose to remain outside of the network to avoid ‘co-optation’, while seeking to influence the network from the

outside. Methods of network characterisation could draw on social network analysis (e.g. Drew et al., 2011) or “ethnoventionism” (van Marrewijk et al. 2010). While ethnoventionism has been primarily developed for intra-organisational work, it can be extended to network evaluation. The evaluator would play the role of a ‘critical friend’, engaging in a long-term relationship with the network, thereby seeking to trigger change from within, while endeavouring to keep a critical distance to the dominant values and framings, and addressing the complex power relations in the network (van Marrewijk et al., 2010: 224).

Task 2: Defining the existing accountability structures

When the evaluand is an evolving, loosely defined network, the accountability structures are equally vague and evolving. The second task would therefore build on the network characterisation and seek to define the existing accountability structures, including notably the horizontal accountability relationships. Evaluating the socio-economic aspects presents particular challenges in megaproject governance. While the accountabilities related to the “iron triangle” issues may be clearly defined by regulatory and legal stipulations, it is usually far less clear who is responsible for the socioeconomic impacts of a megaproject, or for ensuring that the requisite socioeconomic conditions for project implementation are in place. For instance, responsibilities for territorial development are shared by a number of different sectors of public sector management (e.g. transport, regional development, with responsibilities vested in municipal, regional, and departmental authorities).

The typology of Hertting and Vedung (2012) that identifies four types of accountability (table 2) provides a potentially useful basis for clarifying accountability structures. The typology builds on two distinctions: between actors external and internal to the network, and between horizontal and vertical accountabilities. The first accountability relationship – vertical, and internal to the network – concerns the principal’s interest to ensure that its representative in the network governance (agent) indeed properly represents the interests of the principal. Evaluation of this type of accountability could entail for instance a ministry commissioning an evaluation of the work of their employees in a network, in order to ensure these have acted in the interests of the ministry. By virtue of their sheer temporal and spatial scale, megaprojects multiply and accentuate the potential conflicts and tensions that network representatives may experience when torn between multiple loyalties towards their principal on one hand and the other network actors on the other.

The second type of accountability – internal and horizontal – is crucial for the evaluation of megaprojects. It entails *mutual monitoring* amongst network partners, and focuses on the operation of the network as a whole – on criteria such as the quality of cooperation; sincerity of partners; frequency of interaction; representativeness of persons in the network, etc. Trust appears as a crucial variable, especially in those megaprojects with a long history of distrust between network partners – radioactive waste management being a case in point.

The third type of accountability – external and horizontal – is in turn highly relevant for the evaluation of the socio-economic aspects of megaprojects, as it concerns the shared responsibility of the network partners towards relevant outside stakeholders – ultimately to the society as a whole. Here, the key question is how successful the network is in advancing the ‘general interest’ of society, or the interests of individual constituencies external to the network. Questions would concern the extent to which, for example, the chosen radioactive waste management solution advances socio-economic development in the local area surrounding a planned waste disposal site. In radioactive waste policy, the participants external to the network would ultimately include the future generations.

Finally, the fourth accountability relationship – external and vertical – concerns the relationships between an external network ‘facilitator’ or governor and the network. These typically concern issues such as the use of external funds: have the network members correctly used the funds allocated to them by the external network governor? In radioactive waste management, this type of accountability entails the government controlling (auditing) the use of the money allocated to the local municipalities as a compensation for hosting a waste repository. However, accountabilities can be extended beyond the legality of the use of money, to the actual outcomes and impacts of the projects financed by the compensation funds. In such a case, the accountability relationship would also extend from to the external-horizontal combination described above, i.e. the accountability of the municipal authorities (as network members) towards their constituencies.

[Insert table 2]

Definition of accountability structures also includes analysis of the risks that the principal perceives in delegating tasks to the agent. The key question is what are the consequences to the principal if the agent fails to deliver the expected results (Benjamin, 2008). In network governance, mutual accountability relationships also mean mutual dependencies and various types of partly unpredictable and emerging risks. For example, the responsible state authorities and other actors

defending a given waste management solution depend on local actors – authorities, but also the business community and other opinion leaders – for ensuring the acceptance of their preferred solution. To the extent that these local actors are in favour of the project and seek to enhance acceptance, they depend on the state for the resources needed to enhance the perception among the citizens that the project will indeed bring socioeconomic benefits. Local authorities, in turn, have widely varying motivation and capacities to enhance acceptance, which further accentuates the risks incurred by the state in delegating responsibilities downwards. Whether this preferred solution is in the interest of the society as a whole (accountability relationship 3 in table 2), is often contested.

Task 3: clarifying the goals and objectives of the network

The third task of network mapping would be to *clarify the goals and objectives of the network*. The starting point here is again the observation that megaproject evaluation has excessively focused on the “iron triangle” criteria of cost, timetables, and compliance with initial project prescriptions (OMEGA, 2012). To account for the dynamic, emerging goals as an evaluation criterion, broadening out of the evaluative criteria and perspectives would therefore be necessary. The present bias in favour of *ex ante* assessment would likewise need to be complemented by *ex post* evaluation and *ex nunc* monitoring. As a rule, the exploration of project objectives should serve the purposes of “opening up” the evaluation to diverse perspectives and participants (Stirling, 2008) through a stakeholder evaluation approach, since common perceptions, frameworks and visions, but possibly even shared goals, may emerge through networking (Hertting and Vedung, 2012). These goals could be explored from the perspective of the entire network, or from the point of view of an individual network participant (Hertting and Vedung, 2012). Benjamin and Greene (2009) likewise highlight the role of the examination of goal-achievement as a means of fostering learning in network governance.

As for the hitherto largely neglected socio-economic aspects of megaprojects, when the social dimension is addressed, it is frequently done under the notion of ‘socio-economic’, with the emphasis on ‘the economic’ (e.g. Vanclay, 2004). ‘The social’ is typically conceptualised in quantitative and static terms, focusing on its ‘objective’ dimensions that are measurable through externally defined quantitative indicators.⁹ ‘Social impact monitoring’ is often reduced to a “checklist approach”¹⁰, which fails to capture what is specific to ‘the social’, i.e. its reflexive, immaterial, multidimensional and relational character (e.g. Lehtonen, 2004). This type of monitoring is weak at fostering learning, may disempower and objectify people, and tends to reinforce existing power asymmetries while failing to involve local

communities (Rossouw and Malan, 2007). This is not the place to elaborate further on the numerous alternative context-sensitive methods and approaches that seek to integrate the subjective and objective sides of ‘the social’.¹¹ Suffice to say that, as part of network mapping, such monitoring programmes would be developed through iterative and participatory processes, they would explore the interconnections between the social and other dimensions of sustainability, be explicitly based on theoretical models that would be subject to regular review and revision, and seek to identify the causal relationships between the project and its impacts.

A word of caution concerning participation is in order. Megaprojects are typically characterised by strong asymmetries of power between the involved policy actors. Hence, the analysis of the many dimensions or “faces” of power would constitute a crucial element in network mapping in general, and in the evaluation of the social dimension in particular. The focus would be not only on the political and economic but also cultural, ideological, and discursive forms of power (e.g. Galtung, 1972), including its oppressive and liberating manifestations (e.g. Flyvbjerg, 2001: 116-132; Forester, 2001: 269). Because of the considerable temporal and spatial scales involved, as well as the complex articulation between the local/territorial and the national/international, social considerations in megaproject governance often entail a strong ethical and intergenerational component. However, if the objective is to reduce power asymmetries and enhance the broader “deliberative system”, non-deliberative processes of evaluation may be the best option in the context of highly unequal power relations (e.g. Hendriks 2006; Hertting and Vedung, 2012: 42). Deliberative evaluation might in such situations push “legitimate and important conflicts” away from the agenda (Hertting and Vedung, 2012: 42).

Task 4: Evaluation by whom? Exploring the potential role of evaluation and the evaluator

The fourth element of megaproject network mapping – exploration of the role of the evaluation and the evaluator in project governance – builds on the previous three steps. When relationships between stakeholders are characterised by deep and sometimes long-standing mistrust, and when the network boundaries are unclear and subject to constant change, the question of the legitimacy and credibility of the evaluator is particularly crucial. In the context of a multitude of evaluations conducted by various policy actors, network mapping would help better understand the role, credibility, and legitimacy of different actors as potential or actual evaluators. Hence, mapping would contribute to the identification of suitable evaluators, as well as to the understanding of the role of evaluations in project ‘governing’.

In network governance of megaprojects, it is unlikely that any single actor would have both the interest in and the capability of fostering plurality of perspectives and reduction of power asymmetries. Furthermore, in view of the organic, self-organising nature of governance networks (e.g. Regeer et al., 2009; Sanderson, 2012), and more broadly, in the light of the lessons from evaluation literature, the possibility – let alone the desirability – of any single actor controlling the evaluation landscape appears as questionable. The independence of the evaluator in network governance evaluation in the traditional sense would also be unviable and undesirable, when defining the network boundaries –distinguishing between actors internal and external to the network – would itself be a central evaluation task. The evaluator would therefore unavoidably depend on the policy participants in defining such boundaries (Benjamin and Greene, 2009). Independence, credibility and legitimacy of the evaluator would be anchored precisely in this multiplicity of dependencies. Especially in large, complex, unique, and highly technical megaprojects, the challenges related to the dependencies of the evaluator are compounded by the fact that knowledge and expertise tend to be concentrated into few hands, making it difficult to identify competent evaluators perceived broadly as external and independent in the traditional sense of the term.

The solution would again lie in the network itself – in the multiple responsibilities and mutual accountability relationships among the network participants. Evaluation through network mapping would be a distributed task and a shared interest of the network participants, designed to help them to explore and better understand the context of project “governing” (Sanderson, 2012), the broader evaluation ‘ecosystem’, and their own role within this context. In the same way as the definition of the goals of the network, the task of evaluating a megaproject can be conducted from the perspective of the entire network or an individual network participant, through deliberative or non-deliberative processes (Hertting and Vedung, 2012). The task for public authorities would then be on the one hand to adapt to the evaluation ‘ecosystem’ – a task facilitated by the enhanced understanding obtained through network mapping – and on the other hand to manage this ‘ecosystem’ by seeking to reduce the asymmetries of power that prevent the representation of the widest possible variety of relevant points of view and evaluative perspectives. In practice, this would mean supporting the realisation of evaluations by the weaker actors and from underrepresented perspectives, and improving their visibility and likely impact.

Conclusions

Evaluation and megaproject governance literatures have thus far lived largely lives

of their own, with the former having paid little attention to the specific needs of such large infrastructure projects as an evaluation object, and the megaproject literature failing to integrate many of the lessons from evaluation research and practice. This article sought to help bridging this gap by drawing on lessons from network governance evaluation, and offering initial suggestions on how megaproject evaluation might move beyond its currently dominant approach focused on narrowly defined accountability, skewed in favour of the rational actor model, and largely overlooking the broader socioeconomic criteria beyond cost and timetable considerations. The suggestions offered here highlight the key challenge in attempts to deal with uncertainty and complexity inherent in megaprojects: how to turn into strengths the perceived tensions between control and collaboration, between certainty and uncertainty, and between accountability and learning?

The modified “network mapping” approach (Benjamin and Greene 2009) suggested here was designed as a suggestion for a way forward towards a response to such challenges. This approach seeks to retain learning and development as the centrepiece of network evaluation, but suggests the exploration of accountability relationships as a vital tool in the service of learning. While the approach generally advocates broad stakeholder participation and deliberation, and opening up of evaluative perspectives, it does not claim to provide a common overarching framework for megaproject evaluation. By contrast, the call for greater attention to the context of evaluation implies that especially in the context of strong asymmetries of power among policy actors, non-deliberative processes, including approaches along the lines of “speaking truth to power” typical in much of current megaproject literature, may indeed have their role to play. Further research could therefore usefully explore the extent to which the type of network mapping suggested here might be appropriate in given megaproject situations. Evaluation of the radioactive waste disposal projects under preparation in various countries could constitute a fruitful subject for case studies.

Footnotes

¹ The research for this paper has been financed by the French radioactive waste management agency (Andra – Agence nationale de la gestion des déchets radioactifs), as part of a two-year project aimed at exploring approaches and methods for socio-economic evaluation of geological radioactive waste disposal in France. Geological disposal entails the excavation of a shaft 500–1,000 meters below the surface in a stable geological formation, where rooms or vaults can be excavated for the disposal of waste. The goal is to permanently isolate radioactive waste from the human environment. Geological disposal currently represents the radioactive waste management option preferred by the majority of technical experts and organisations in the area. For a brief presentation of the geological disposal project in France, see http://www.andra.fr/international/download/andra-international-en/document/Andra_Geological.pdf

² Here, the definition by Hertting and Vedung (2012: 36) is adopted: “Evaluation is the careful assessment of the merit, worth, and value of organisation, content, administration, output, and effects of ongoing or finished government interventions, which is intended to play a role in future, practical action situations.” Hence, evaluation goes beyond the outcomes and effects, and includes organisational and process-related criteria. However, the definition in this article differs from that of Hertting and Vedung to the extent that it includes also *ex ante* evaluation and assessment – while Hertting and Vedung (2012: 36) exclude interventions that exist only “on the drawing board”.

³ However, the pattern of “national gain, local harm” is not always clear-cut. Flyvbjerg (2011: 329) notes that local interests often win over national-level considerations in decision-making on megaprojects, because of asymmetries of information that favour local authorities, politicians, and consultants. Yet sometimes the local authorities and businesses are the most eager advocates of megaprojects. For instance, transport infrastructure projects are often expected to generate considerable socioeconomic benefits at the local level, while potentially constituting a burden on the public purse. However, the potential harmful social impacts of megaprojects tend to fall disproportionately on the local level actors (e.g. Theys, 2002; Gagnon et al., 2008, 5).

⁴ Flyvbjerg (2011: 322, 335) mentions the Bilbao Guggenheim museum and a major tunnelling project conducted as part of the preparations for the Sydney 2000 Olympics as among the few exceptions of successful megaprojects.

⁵ For instance, nuclear power plant construction exhibits similar irreducible value conflicts, but do not have the same character of “a problem that just needs to be

solved”, nor do they evoke similar debates on very long term intergenerational justice.

⁶ Koppenjan et al. (2010) contrast two approaches to megaproject management and uncertainty – the “*predict and control*” approach in which “uncertainty is calculated as risk and everything is done to control as many aspects as possible, for instance through time and cost buffers”, and the “*prepare and commit*” approach, which embraces irreducible uncertainty as an inherent part of project management, which should in turn be organised in a manner that it can respond to unexpected developments (Giezen, 2012: 784).

⁷ Relevant and related concepts found in the literature include network governance (Provan and Kenis, 2007), network management (Kickert et al., 1997), new modes of knowledge production (Gibbons et al., 1994; Nowotny et al., 2001), network steering, reflexive governance (Voß et al., 2006), deliberative democracy (Dryzek, 2000), and transition management (Loorbach, 2007).

⁸ Until the early 1990s, radioactive waste management policy was a typical example of such a ‘policy silo’, with technical engineering considerations given exclusive emphasis.

⁹ ‘Objective’ is here defined as information independent of the observer, as opposed to ‘the subjective’ information that depends on individual judgement by the observer.

¹⁰ Objects of such monitoring typically include demographic impacts, impacts on ways of life and land use, local/regional economy and intra-firm learning, public participation, quality of life and perceptions, and social equity (Gagnon, 2003: 99).

¹¹ Useful lessons could be drawn from technology assessment (Russel et al., 2010), social impact assessment (Vanclay, 2004), institutionally oriented ecological economics (Vatn, 2009), the ‘capability approach’ (Sen, 1999), social capital theory (Ballet et al., 2007), territorially sustainable development (Gagnon et al., 2008), and territorial social well-being (Renault, 2011).

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